SERVICE MANUAL

PHYSIOMED-Expert 2
PHYSIOMED–IF–Expert 2

Revision: 09 / 2008
Valid from Instrument No.: PME 2 - 0300211
And PIE 2 - xx001xx 17900

CE 1275

PHYSIOMED®

TECHNOLOGY FOR THERAPY

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1 Technical Data

Protection class	I acc. To VDE 0750 / IEC 601 Typ: BF
CE characterization	acc. to Council Directive concerning medical devices (93/42 EEC)
Class acc. EEC 93/42	IIa
Power supply	230 VAC ± 10% or 115 VAC ± 10% Note Settings indicated at the mains module!
Power line frequency	50 … 60 Hz
Current consumption	0.3 A (at 230 V) or 0.6 A (at 115 V)
Power consumption	68 VA
Line fuses	at 230 V: T 1 A at 115 V: T 2 A
Output data STIMULATION	75 mAs (maximum) at 500 Ohm
Ambient temperature	+ 10°C ... + 40°C
Dimensions (W x H x D)	34.5 x 13.3 x 34.8 cm
Weight	5.1 kg

2 Housing Construction

PHYSIOMED-Expert 2 / **PHYSIOMED-IF-Expert 2** is a single shell construction in a plastic housing.
Always disconnect the power lead before opening the instrument.

3 General Notes

PHYSIOMED-Expert 2 / **PHYSIOMED-IF-Expert 2** is a two-channel stimulation current therapy unit. You can apply the whole range of current modes from low- to medium-frequency including the classic interferential current. The instrument also offers you programs for diagnosis by stimulation current. The unit can also be used for simultaneous therapy (stimulation current and ultrasound in ONE treatment if you combine it with a suitable ultrasound therapy unit (e.g. **PHYSIOSON-Expert**).

4 Note

The structure of the following service instructions allows you to do a basic balancing.

As a rule, for later balancing (e.g. repair), only parts of the balancing procedure are necessary, which can all be adjusted by the trimming potentiometer (provided that grave errors concerning the balancing procedure are not apparent or have been cleared).

5 Additional Equipment Required

	State of calibration *
Oscilloscope (with probe)	B
Digital multimeter AC and DC	B
Frequency meter	B

* State of calibration B = precision 5%

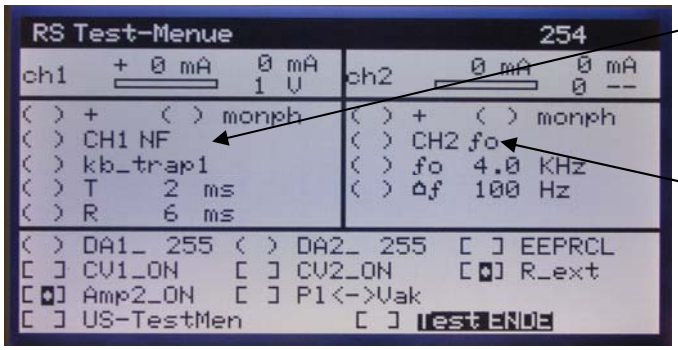
The following documents provide information necessary for the balancing procedure, such as positions of the trimmers or test points:

- Wiring Scheme
- Parts List
- Operating Instructions

6 Test Menu

The test menu is used to select and display service relevant parameters of the instrument. In order to get into the test menu you have to set short-circuit plug **JP2** at Pc board 9902-2 on position 1+2 and then turn on the instrument.

6.1 Test Menu Stimulation Current


RS Test-Menue
254
ch1
+ 0 mA
0 mA
1 V
ch2
0 mA
0 mA
0 --
( ) + ( ) monph
( ) CH1 NF
( ) kb_trap1
( ) T 2 ms
( ) R 6 ms
( ) + ( ) monph
( ) CH2 fo
( ) fo 4.0 KHz
( ) Δf 100 Hz
( ) DA1_ 255 ( ) DA2_ 255 [ ] EEPRCL
[ ] CV1_ON [ ] CV2_ON [■] R_ext
[■] Amp2_ON [ ] P1<->Vak
[ ] US-TestMen [ ] Test ENDE

Selection **Channel 1**

Selection **Channel 2**

Display Circuit: Set Value I

Value measured output I

Value measured output U

You will find a similar layout of the display for circuit II (ch2). By using the following overview table you can get information for possible adjustable parameters and displays:

Selection Field Circuit I	**Available Options**
( ) +	Positive signal / Negative signal
( ) CH1 NF	NF/ MF / MC **basic signals**
( ) monph	Monophasic signal / Biphasic signal
( ) kb_trap1	Signal waveform
( ) T	Impulse duration of the signal
( ) R	Pause duration of the signal
Selection Field Circuit II	**Available Options**
( ) +	Positive signal / Negative signal
( ) monph	(unused; CH1 also switches CH2)
( ) CH2 f_0	f_0 / AMF / NF / NF_HV / NF_2 **basic signals**
( ) f_0 4 KHz	Adjusting of basic frequency
( ) Δ f 100Hz	Adjusting of modulation frequency
Lower Selection Field	**Available Options**
( ) DA1_255	Adjust circuit I by means of the DA converter
( ) DA2_255	Adjust circuit II by means of the DA converter
[ ] EEPRCL	EPROM clear (e.g. clearing all individual programs)
[ ] CV1_ON	Activate constant voltage
[ ] CV2_ON	Activate constant voltage
[ ] R_ext	Switch signal to external lead resistor
[ ] Amp2_ON	Activate output transistor in circuit 2
[ ] Pl ⇔ Vak	Switching between plate electrodes – vacuum electrodes
[ ] US-TestMen	Selection of the ultrasound test menu (unused)
[ ] Test END	Exit test menu

7 Balancing Procedure

7.1 Setting up

- Check line fuses; refer to technical data and reference labels.
- Check fuses **F1-F4** of secondary circuit; refer to parts list of power supply and to reference labels.
- Connect power cord

7.2 Checking the Power Supply; PC Board No. 9902-2

7.2.1 Not Stabilized

Measure +7.8 V at **TP_5** Nominal Value: +6.6 V...+9.0 V
Measure voltage towards GND at TP_6.
Measure +34 V at **TP_4** Nominal Value: +30 V…+38 V
Measure voltage **towards –15 V at TP_3**.
Measure +125 V at **R119** Nominal Value: +110 V ... +140 V
Measure – 125 V at **R114** Nominal Value: - 110 V ... – 140 V
Measure voltage **towards GND at TP_{10}**.

7.2.2 Stabilized

Measure + 5 V at **TP_1**, Nominal Value: + 4.9 V...+ 5.2 V
Measure +15 V at **TP_2**, Nominal Value: +14.8 V...+15.2 V
Measure – 15 V at **TP_3**, Nominal Value: -14.8 V...- 15.2 V
Measure voltage towards GND at TP_{10}.

7.3 Balancing PC-Board No.: 9902-2 (Stimulation Current)

7.3.1 Balancing I: Offset Set Up of Output Transformer

Preparation:

- JP2 to position 1+2 : *(Test Mode)*
- Turn intensity to zero
- Adjust earth connection of the oscilloscope at **TP_{10} (GND)**
- Switch on the instrument
- Measure offset-voltage at housing of **V33**
- Do following adjustments in the stimulation current test menu
- kb_trap1 adjust signal waveform
- R_ext select external resistance

Adjust offset-voltage to zero by using pad-trimmer **R104**

When selecting **CV1_ON** in the stimulation current test menu, the offset voltage should not change. If it does, use pad-trimmer **R104** to adjust.

7.3.2 Balancing II: Offset Set Up of Pulse Generation

Preparation:

- **CV1_ON** not activated
- Turn intensity to maximum
- Adjust earth connection of the oscilloscope at **TP_{10} (0 V)**
- Measure offset-voltage at housing of **V33**

Adjust offset-voltage to zero by using pad trimmer **R53**

7.3.3 Adjustment of Output Current

Preparation :

- **CV1_ON** : not activated
- **kb_trap1** : adjust signal waveform
- **R_ext** . external resistance activated

Plug in the external test resistance **R = 500 Ohm**

Channel 1:

Setting up low frequency output current

CH 1 NF is set in the menu **channel 1**

Turn intensity to maximum

The **low frequency output current** of **circuit 1** is to be adjusted by trimmer **R60**

The value appearing to the right of the intensity display in circuit 1 must be **74 … 75 mA.** The maximum value of the measured current must be between
$\mathbf{U_{S,min} = 33.8\ V}$ and $\mathbf{U_{S,max} = 37.5\ V}$.

Channel 2:

Setting up interference output current

CH 2 fo is set in the menu **channel 2**

Turn intensity to maximum

The **Interference output current** of **circuit 2** is to be adjusted by trimmer **R72**.

The value appearing to right of the intensity display in **circuit 2** must be **74 … 75 mA**
The maximum value of the measured current must be between
$\mathbf{U_{S,min} = 33.8\ V}$ and $\mathbf{U_{S,max} = 37.5\ V}$.

Setting up low frequency output current

CH 2 NF is set in the menu **channel 2**

Turn intensity to maximum

The low frequency output current of **circuit 2** is to be adjusted by trimmer **R252**.
The value appearing to right of the intensity display in **circuit 2** must be **74 … 75 mA**
The maximum value of the measured current must be between
$\mathbf{U_{S,min} = 33.8\ V}$ and $\mathbf{U_{S,max} = 37.5\ V}$.

The value appearing right to intensity-display in **circuit 2** has to be **74 … 75mA**
Maximum value of the measured currency has to be between $\mathbf{U_{S,min} = 33,8V}$ and $\mathbf{U_{S,max} = 37,5V}$

Setting up frequency of special current modes (e.g. KOTS)

CH 2 NF_2 is set in the menu **channel 2**

Turn intensity to maximum

The special current mode of **circuit 2** is to be adjusted by trimmer **R251**.
The value appearing to the right of the intensity display in **circuit 2** must be **67 mA**
To return to regular operation mode, set JP2 to position 2+3.

Instrument self-test:

(in the selection stimulation current test menu)

Select the **[ ] Test END**

The instrument will carry out an **automatic self-test routine**

9902-2
CH1 NF/ IF R 60

CH2 NF	R252	
CH2 NF2	R 251	(+40/-40)
CH2 f_0	R 72	

Tolerance of selftest values				
Stimulation current mA:	**10** ± 2	**50** ±5	**70** ±5	**80** 78 - 85

The values displayed here are important assessment criteria for our service department.

The assessment of the parameters enables us to make a diagnosis of the technical state of the device.

If the measured values are not within tolerance, the automatic self-test is interrupted and an error code is displayed. It can be restarted by pressing the selection-button. If settings are done, the self-test routine will end with the message:

CH1+CH2 HWT OK

To return to THERAPY MODE, set **JP2** back to position 2 + 3.

8 Checking the Instrument

8.1 Checking Connection

Check the whether line voltage of the device (see "red window" in the mains module) and the rated voltage correspond.

8.2 Checking Display and Display Elements

Turn both intensity controls to 0.

Switch off the device and switch it on after 5 sec.

The instrument will carry out an automatic self-test routine.

- Display is tested
- All functions and output values of the stimulation current unit are checked
- Pulse indicators are illuminated
- Patient current and output indicators are illuminated
- An acoustic signal is audible

Either the start menu or the display of the last selected current type appears.

8.3 Checking the Therapy Timer

- Connect oscilloscope to the output
- Select any current type

By using the Therapy timer you can adjust time from 0-30 min in 1 min. intervals.

- Adjust a therapy time of 30:00 min.
- Turn on intensity

Timer is started, therapy time decreases.

Turn therapy time to 0.

An acoustic signal is audible, intensity is decreasing and Intens ← appears in the lower status line.

8.4 Checking the Current Types

Connect oscilloscope to output.

Check all current types, pulse and rest times according to operating instructions.

8.5 Checking Function of the Selection Fields

Check all selection fields according to operating instructions.

8.6 Display Wire of Air Gap and Leakage Distance

Check air gap and leakage distance (2.5 mm / 4 mm); you should also pay attention to the position of the display wire.

9 Error Codes

Self Test	
ERROR 0mA CH1	**Operating point difference current circuit 1 at 0 mA** **Reason:** control power supply and F1 (160mA), flat ribbon cable main-/frontboard, V25/24 control function of K4
ERROR 10mA CH1	**Operating point difference current circuit 1 at 10 mA** **Reason:** control power supply and F1 (160mA), flat ribbon cable main-/frontboard , V25/24, R113
ERROR 50mA CH1	**Operating point difference current circuit 1 at 50 mA** **Reason:** control power supply , V 48 and CC/ CV function of N9 (81C55) flat ribbon cable main-/frontboard
ERROR 70mA CH1	**Operating point difference circuit 1 at 70 mA** **Reason:** control power supply, flat ribbon cable main-/frontboard, V36,V44/45
I80_HARD_ERROR	**Current circuit 1 > 80 mA Hardware triggers** **Reason:** control power supply (+15DCV , out of tolerance) V10, N3, flat ribbon cable main-/front board
I80_SOFT_ERROR	**Current circuit 1 > 80 mA Software triggered** **Reason:** control power supply (+15DCV , out of tolerance) V10, N3, flat ribbon cable main-/front board
ERROR 0mA CH2	**Operating point difference current circuit 2 at 0 mA** **Reason:** control power supply flat ribbon cable main-/front board
ERROR 10mA CH2	**Operating point difference current circuit 2 at 10 mA** **Reason:** control power supply flat ribbon cable main-/front board
ERROR 50mA CH2	**Operating point difference current circuit 2 at 50 mA** **Reason:** control power supply flat ribbon cable main-/front board
ERROR 70mA CH2	**Operating point difference circuit 2 at 70 mA** **Reason:** control power supply flat ribbon cable main-/front board
I80_HARD_ERROR CH2	**Current circuit 2 > 80 mA Hardware triggers** **Reason:** control power supply (+15DCV , out of tolerance) V10, N3, flat ribbon cable main-/front board
I80_SOFT_ERROR CH2	**Current circuit 2 > 80 mA Software triggered** **Reason:** control power supply (+15DCV , out of tolerance) V10, N3, flat ribbon cable main-/front board

Therapy	
ERROR uP Watchdog	**Watchdog-error** **Reason: replace µP Processor**
ERROR T2 Watchdog	**Timer2 Watchdog-error** **Reason: replace µP Processor**
ERROR T/R	**Impulse-/resting-time error** **Reason:** flat ribbon cable main-/front board KFG Eprom N11,
ERROR CH1 I 20%	**Operating point difference circuit 1** Reason: flat ribbon cable main-/front board, dose potentiometer mechanically damaged, faulty balance
ERROR CH2 I 20%	**Operating point difference circuit 2** Reason: flat ribbon cable main-/front board, dose potentiometer mechanically damaged, faulty balance
ERROR CH1 INTENS.ZERO	**Current circuit 1 > 0, although control 1 is at zero position** **Reason:** flat ribbon cable main-/front board ,faulty offset balance, dose potentiometer mechanically damaged
ERROR CH2 INTENS.ZERO	**Current circuit 2 > 0, although control 2 is at zero position** **Reason:** flat ribbon cable main-/front board, faulty offset balance, dose potentiometer mechanically damaged
I80_HARD_ERROR	**Current circuit 1 > 80 mA Hardware triggers** **Reason:** control power supply (+15DCV, out of tolerance) V10, N3
I80_SOFT_ERROR	**Current circuit 1 > 80 mA Software triggered** **Reason:** control power supply (+15DCV , out of tolerance) V10, N3
I80_HARD_ERROR CH2	**Current circuit 2 > 80 mA Hardware triggers** **Reason:** - control power supply (+15DCV , out of tolerance) V10, N3
I80_SOFT_ERROR CH2	**Current circuit 2 > 80 mA Software triggered** **Reason:** - control power supply (+15DCV , out of tolerance) V10, N3
CH2 NF ERROR	**NF input voltage for circuit 2 is too high (R72)**

9.1 Important Service Note

In case of service and updating the system please note:

Adapter PCB 0607-1 2CH
is the substitute of **IC N23 ML2035 and N24 ML2035**

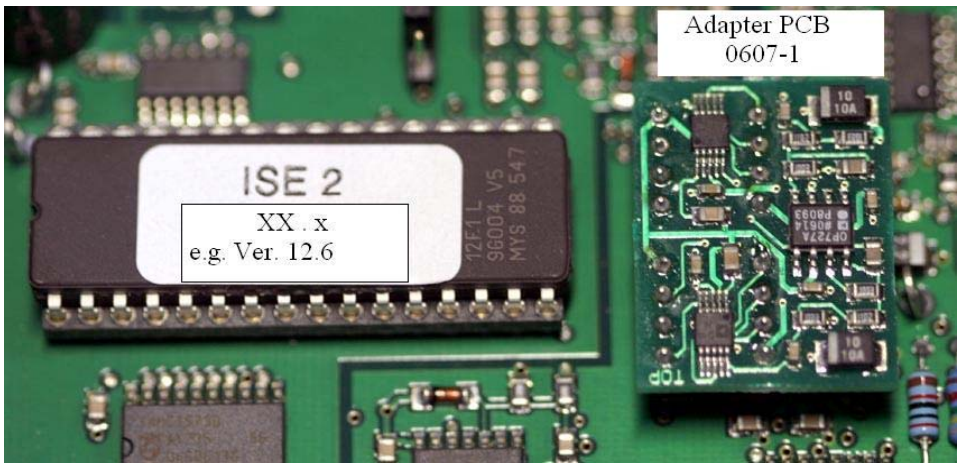
Software Versions:

ISE2 / PME2 xx.x1 **only to use for N23 ML2035 and N24 ML2035**
(picture 1) **at 9902-2 Rev. 1.10**

ISE2 / PME2 xx.x **only to use for adapter PCB 0607-1**
(picture 2) **at 9902-2 Rev. 1.10**

This is valid from the SW Ver. 12.3 from May 2006.

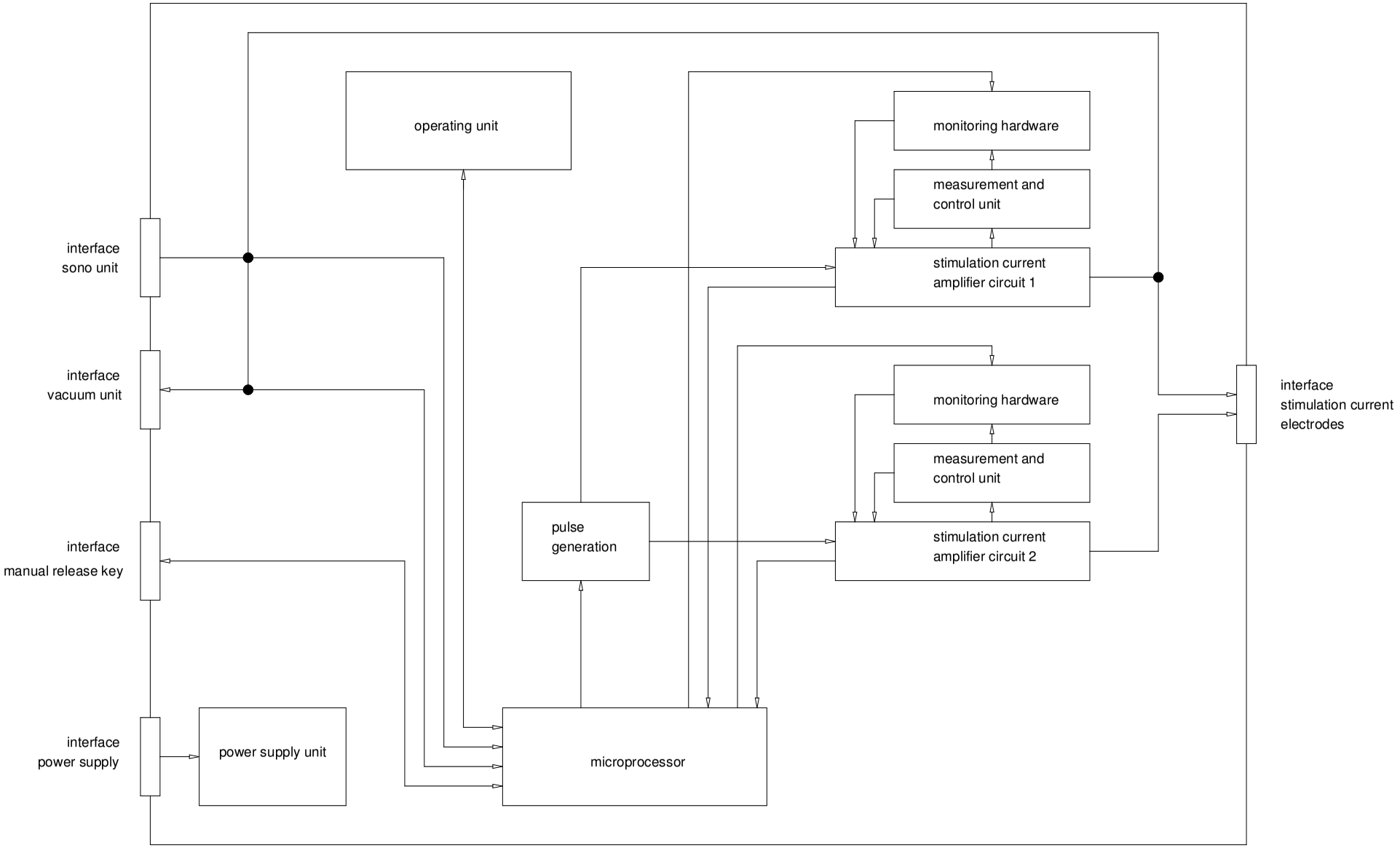
Picture 1



Picture 2

p.ID: **00091** **var./sw:** 1/0-0-0 **desc 1/2:** PHYSIOMED-Expert Reizstromgerät
O#: 00091 **desc 3/4:**
ND: PHYSIOMED EXPERT **desc 5/6:**
Ersteller: Legl **desc 7/8:**

part number / O-No		description / ND	step/cost	perpos.no.	item notice		quantity		
50076	[¶]	acrylic plastic front plate PHYSIOMED-Expert	1	1	1		1,0000	Stk	
50078	[»]	9805-2 cpl. front pc-board	1	1	2		1,0000	Stk	
51311	[¶]	9902-2-Exp full set a. checked main pc-board Rev 1.10	1	1	3		1,0000	Stck	
50046	[»]	9806-1 full set inverter pc-board	1	1	4		1,0000	Stk	
51200	[¶]	Display SP14N001	1	1	5		1,0000	Stck	
51199	[¶]	foil cable FFC1.00A26/0240L5.0-5.0-10.0-1	1	1000	6		1,0000	Stck	
50011	[¶]	Control button/ transmitter CESI 16 / LS-PM	1	1	7		1,0000	Stk	
50015	[¶]	fuse T 1 A	1	100	8		2,0000	Stk	
50020	[¶]	select buttom small 24mm A1024069	1	1	9		2,0000	Stk	
50022	[¶]	lable scale RAL 5021 A 1105011	1	100	10		2,0000	Stk	
50023	[¶]	select buttom large RAL 5021 102001	1	1	11		1,0000	Stk	
50021	[¶]	button top cover d=24mm 666215	1	1	12		1,0000	Stk	
50560	[¶]	flat ribbon cable Typ 7-2 "F" cpl.	1	100	13		1,0000	Stk	
50535	[¶]	Net input module PSOS XD H3A	1	1	14		1,0000	Stk	



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				Gepr.			
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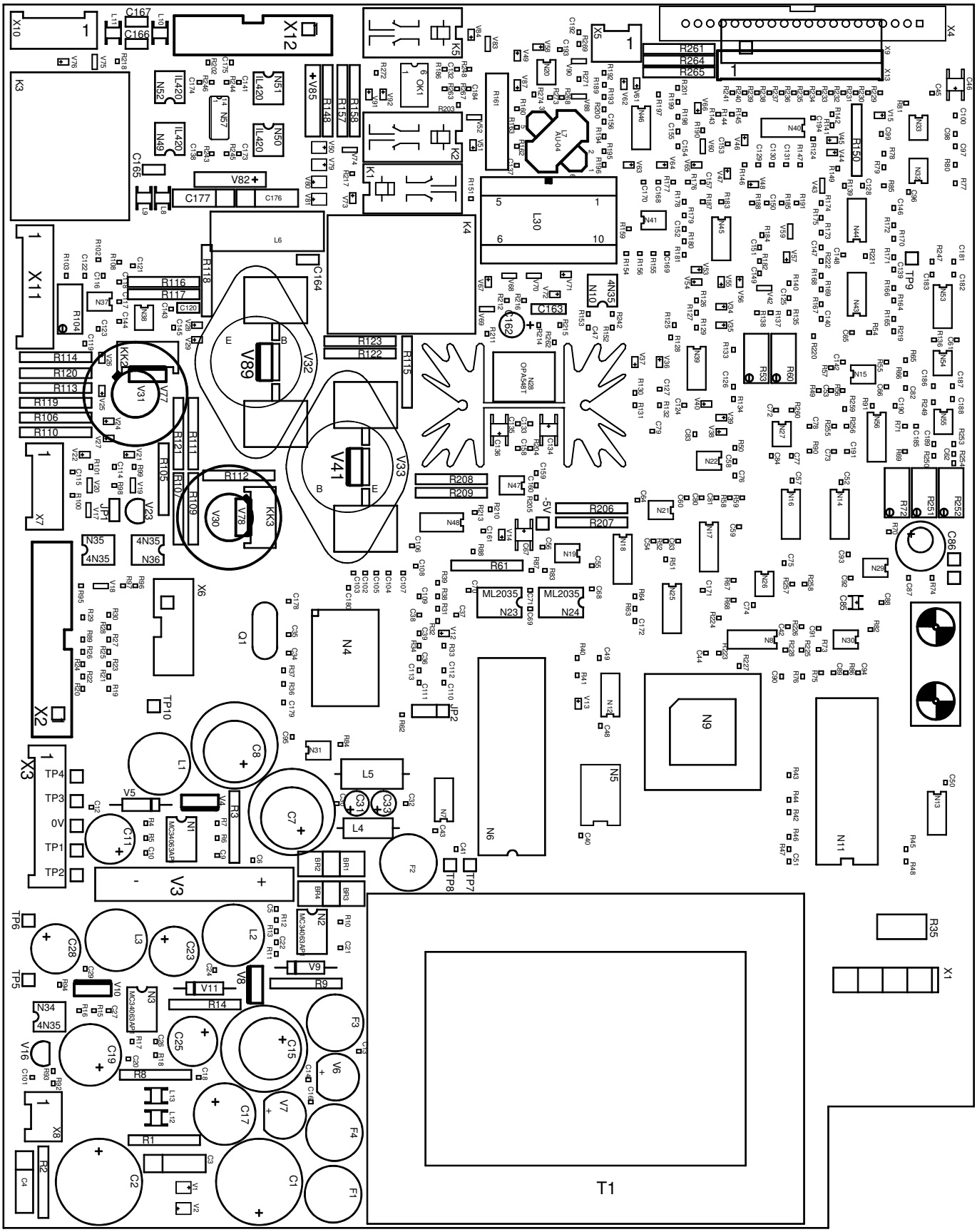
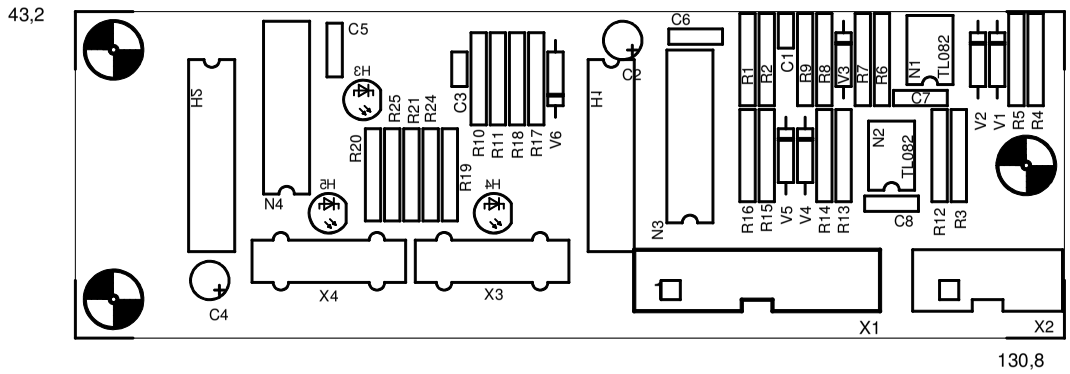
							Blatt 1
Rev	Aenderung	Datum	Name				File bd-gb-pme2



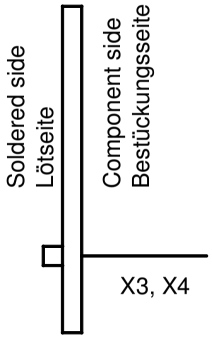
99-000045-2 REV 1.10

1.10	02.09.2003		Grö		Datum	Name	Component Placement Main Board Bestückungsplan Hauptplatine IONOSON-Expert 2 PHYSIOMED-Expert 2
				Bearb.	02.09.03	Nie	
				Gepr.			
							Physiomed ELEKTROMEDIZIN Hutweide 10 91220 Schnaittach / Laipersdorf /Germany
							Platine PC-Board 9902-2 Rev. 1.10 Blatt 1/1
Rev		Datum	Name				File be9902-2_rev_1_10



Soldered side:
Lötseite:

H1, H2, H3, H4, H5
X3, X4



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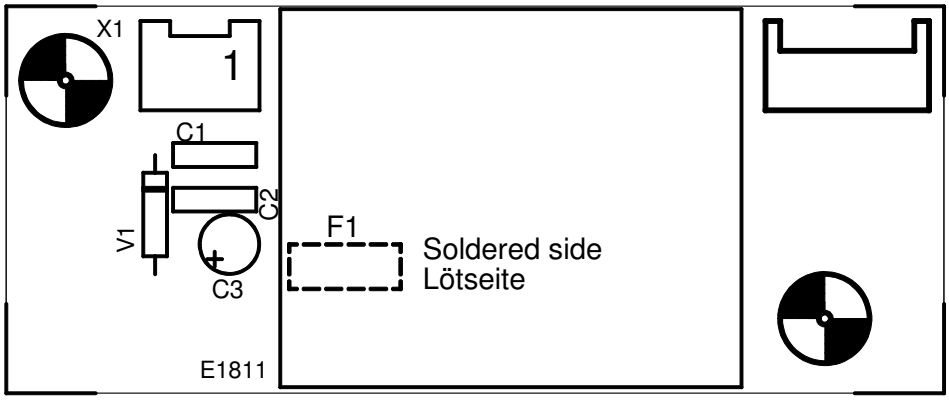
				Gepr.			
				Physiomed ELEKTROMEDIZIN Hutweide 10 91220 Schnaittach / Laipersdorf /Germany			Platine PC-Board 9805-2 Rev 1.10 Blatt 1
Rev		Datum	Name				File Be9805-2_rev_1_10



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							Bestückungsplan Inverterplatine
				Physiomed Elektromedizin Hutweide 10 91220 Schnaittach / Laipersdorf / Germany			Platine 9806-3
Rev		Datum	Name				File Be9806-3.brd